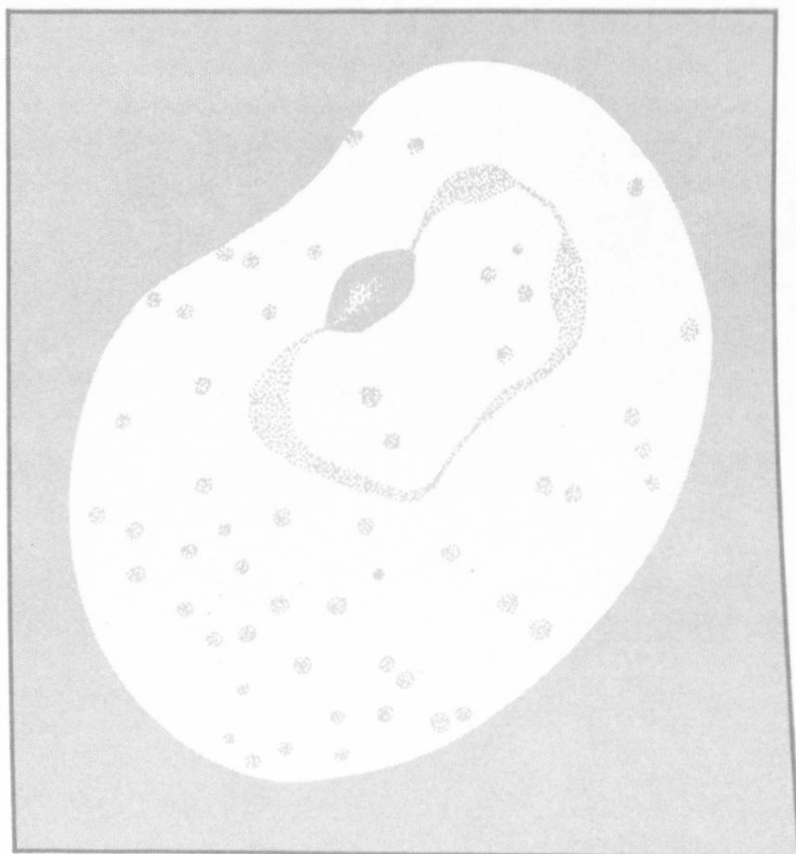


ANNUAL SUMMARY 1979  
Issued November 1980

CENTERS FOR DISEASE CONTROL  
**MALARIA**  
**SURVEILLANCE**



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES • Public Health Service

## P R E F A C E

This report summarizes information received from state health departments, medical departments of the Armed Forces, and other pertinent sources. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the Surveillance Report are most welcome. Please address them to:

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## I. SUMMARY

In 1979, 839 cases of malaria were reported to the Center for Disease Control for the United States, a 36.2% increase over the 616 cases reported for 1978. Fewer cases were reported in military personnel and United States civilians than in 1978 (Table 1). Seventy-two percent of all cases reported in 1979 were found among foreign civilians, a 90.8% increase over 1978.

As in previous years, imported Plasmodium vivax infections were more common than P. falciparum (67% versus 20%).

In 4 cases, infection was acquired in the United States, in 1 by blood transfusion and in 3 by congenital transmission. Two deaths attributed to malaria were reported in 1979, the same number as reported in 1978. One occurred in a missionary who traveled to Haiti; the other was in a tourist who visited Kenya. Both deaths were due to P. falciparum. No introduced malaria was reported in 1979.

## II. TERMINOLOGY

The terminology used in this report is derived from the recommendations of the World Health Organization (1,2). The definitions of the following terms are included for reference purposes.

### A. Autochthonous

1. Indigenous - malaria acquired by mosquito transmission in an area where malaria is a regular occurrence.
2. Introduced - malaria acquired by mosquito transmission from an imported case in an area where malaria is not a regular occurrence.

### B. Imported

Malaria acquired outside of a specific area (the United States, Puerto Rico, and Guam in this report).

### C. Induced

Malaria acquired through artificial means, i.e., blood transfusion, common syringes, or malariotherapy.

### D. Relapsing

Renewal of clinical symptoms occurring after therapy for primary attack; the interval between attacks is greater than that due to known periodicity of untreated infections.

### E. Cryptic

An isolated case of malaria not associated with secondary cases as determined through appropriate epidemiologic investigation.

## NOTICE

This report covers the calendar year January 1-December 31, 1979. In 1980 as of November 8, there have been 1,670 cases of malaria reported in the United States. This is a 251 percent increase from the 665 cases reported for the comparable 45 week reporting period in 1979. The majority of the 1980 cases are in refugees from Southeast Asia.

### III. GENERAL SURVEILLANCE

For 1979, 839 cases\* of malaria with onset in 1979 in the United States and territories were reported to the Parasitic Diseases Division, Center for Disease Control; this represents a 36.2% increase over the number recorded for 1978 when 616 cases were reported. As in 1978 most of the reported cases were in civilians, which comprised 99% of all cases diagnosed in this country (Fig. 1). Fewer cases occurred in military personnel in 1979 (11) than in 1978 when 31 cases were reported. The number of military cases remained at the low levels seen after the Vietnam War years (Table 1).

In 4 of the 825 civilian cases and in none of the military cases, patients acquired their infection in the United States. One case was transfusion induced due to P. falciparum. Three cases were congenital: 2 were due to P. vivax and 1 to a mixed infection of P. vivax and P. falciparum. No introduced cases occurred.

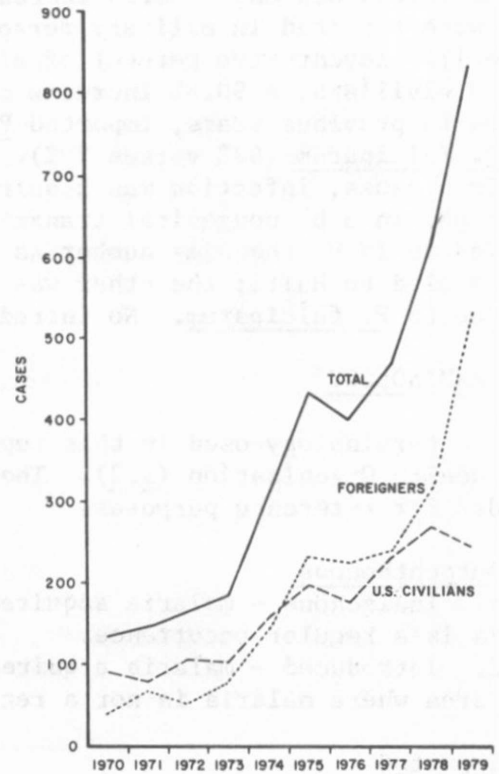


Table 1 Primary Military and Civilian Malaria Cases, United States, 1966-1979\*

Year	Military	U.S. Civilian	Foreign Civilian	Unknown	Total
1966**	621	89	32	22	764
1967**	2699	92	51	15	2857
1968**	2567	82	49	0	2698
1969**	3914	90	47	11	4062
1970**	4096	90	44	17	4247
1971**	2975	79	69	57	3180
1972**	454	106	54	0	614
1973**	41	103	78	0	222
1974**	21	158	144	0	323
1975**	17	199	232	0	448
1976**	5	178	227	5	415
1977**	11	233	237	0	481
1978	31	270	315	0	616
1979	11	224	601	3	839

\*Onset of illness in the United States and Puerto Rico

\*\*Figures for these years have been updated to include cases reported after the publication of previous annual summaries

\*A "case" is defined as an individual's first attack of malaria in the United States, regardless of whether or not he had experienced previous attack of malaria while outside the country. A subsequent attack in the same person caused by a different Plasmodium species is counted as an additional case. Repeat attacks in this country caused by the same species are considered relapses, not additional cases. All cases included in this report were diagnosed as malaria on the basis of a positive peripheral blood smear examined in the local or state health department laboratory. Doubtful cases were referred to the National Malaria Repository, CDC.



The proportions of cases caused by each Plasmodium species generally showed little change in 1979 from 1978 (Table 2).

The countries in which the 839 patients contracted malaria are shown in Table 3. Asia accounted for 62.6% of cases, Africa for 20.2%, Central America and the Caribbean for 11%, South America for 1.9%, Oceania for 2%, and North America for 3.9%. The number of malaria cases reported from Asia in 1979 is a 67.8% increase over the number of cases reported in 1978. This number does not reflect a marked increase in cases from India as in previous years (265 cases in 1979 compared with 241 cases in 1978) but rather reflects the immigration of Southeast Asian refugees into the United States.

Although, as in 1978, the largest number of cases from a single country was reported from India (265 cases or 31.2% of all cases reported in 1979), large numbers of patients acquired their infection in Indonesia (62), Vietnam (59), Cambodia (57), Nigeria (50), and El Salvador (34).

Figure 2 shows the geographic distribution of the 1979 malaria cases by the state in which clinical symptoms of the disease first developed in the patient.

Table 2 Malaria Cases by Plasmodium Species, United States, 1979

Species	Total	Percent
<u>P. vivax</u>	564	67.2
<u>P. falciparum</u>	169	20.1
<u>P. malariae</u>	30	3.6
<u>P. ovale</u>	7	.8
Mixed Infections	14	1.7
Undetermined	55	6.6
Total	839	100.00

Fig. 2 GEOGRAPHIC DISTRIBUTION OF MALARIA CASES WITH ONSET IN UNITED STATES, 1979



Table 3 Malaria Cases by Distribution of *Plasmodium* Species and Area of Acquisition, United States, 1979\*

Area	<i>vivax</i>	<i>falciparum</i>	<i>malariae</i>	<i>ovale</i>	mixed	unknown	total
<b>AFRICA</b>	<b>44</b>	<b>83</b>	<b>10</b>	<b>7</b>	<b>3</b>	<b>21</b>	<b>168</b>
Africa, East	2	0	0	0	0	0	2
Africa, South	0	3	0	0	0	0	3
Africa, West & Central	6	6	0	0	0	0	12
Africa, Unspecified	4	10	0	0	0	0	14
Cameroon	0	1	0	0	0	0	1
Congo (Brazz)	1	5	3	2	0	0	11
Egypt	0	1	0	0	0	0	1
Ethiopia	2	0	0	0	0	0	2
Gabon	3	0	0	0	0	0	3
Ghana	2	12	1	0	0	7	22
Ivory Coast	0	2	0	0	0	0	2
Kenya	4	8	1	0	0	2	15
Liberia	2	3	1	0	0	4	10
Morocco	0	1	0	0	0	0	1
Niger	0	1	0	0	0	0	1
Nigeria	14	24	2	2	2	6	50
Senegal	0	1	0	0	0	0	1
Sierra Leone	2	2	2	0	1	2	9
Sudan	2	0	0	0	0	0	2
Tanzania	0	0	0	2	0	0	2
Togo	0	0	0	1	0	0	1
Uganda	0	1	0	0	0	0	1
Upper Volta	0	2	0	0	0	0	2
<b>ASIA</b>	<b>404</b>	<b>67</b>	<b>15</b>	<b>0</b>	<b>9</b>	<b>30</b>	<b>525</b>
Asia, Southeast	5	1	0	0	0	0	6
Asia, Unspecified	4	10	0	0	1	0	15
Borneo	1	0	0	0	0	0	1
Burma	1	0	0	0	0	0	1
Cambodia	44	6	1	0	1	5	57
Ceylon	1	0	0	0	0	0	1
Hong Kong	1	0	0	0	0	0	1
India	236	5	8	0	1	15	265
Indonesia	34	22	3	0	1	2	62
Laos	4	10	0	0	1	0	15
Malaya	6	2	0	0	0	0	8
Middle East	1	0	0	0	0	0	1
Nepal	1	0	0	0	0	0	1
Pakistan	11	1	0	0	0	0	12
Philippines	5	0	0	0	0	0	5
Thailand	9	2	1	0	0	1	13
Turkey	1	0	0	0	1	0	2
Vietnam	39	8	2	0	3	7	59
<b>CENTRAL AMERICA AND CARIBBEAN</b>	<b>76</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>90</b>
Central America							
Unspecified	7	0	0	0	0	0	7
Belize	3	0	0	0	0	0	3
El Salvador	32	0	0	0	0	2	34
Guatemala	11	0	0	0	0	0	11
Haiti	0	8	0	0	0	0	8
Honduras	11	1	0	0	1	1	14
Nicaragua	11	0	0	0	0	0	11
Panama	1	1	0	0	0	0	2
<b>NORTH AMERICA</b>	<b>22</b>	<b>4</b>	<b>5</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>33</b>
Mexico	16	0	3	0	0	1	20
United States	6	4	2	0	1	0	13
<b>SOUTH AMERICA</b>	<b>14</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>17</b>
South America							
Unspecified	2	1	0	0	0	0	3
Brazil	3	1	0	0	0	0	4
Colombia	5	0	0	0	0	0	5
Guiana	0	1	0	0	0	0	1
Peru	4	0	0	0	0	0	4
<b>OCEANIA</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>
New Guinea	3	2	0	0	0	0	5
Oceania	1	0	0	0	0	0	1
<b>Total</b>	<b>564</b>	<b>169</b>	<b>30</b>	<b>7</b>	<b>14</b>	<b>55</b>	<b>839</b>

For cases on which the exact date of arrival in the United States and the date of onset of illness were available, clinical malaria developed within 30 days of arrival in the United States in 45.6% of persons with P. falciparum infection and in 22.9% of those with P. vivax infection (Table 4). In United States citizens, within 6 months after they returned to this country, 91.8% of patients with P. falciparum malaria and 77.9% of those with P. vivax malaria developed clinical symptoms. Twenty-four patients (29%) became ill with malaria 12 months or longer after the last possible exposure to malaria abroad.

Of the 839 cases reported in 1979 and for which the hospitalization status was known, 86.9% of patients required hospitalization. The majority of patients were initially treated in civilian hospitals (Table 5). The Armed Forces and Veterans Administration have made complete malaria reporting a major responsibility of their hospital staffs. Reporting by civilian physicians, however, is largely a matter of individual initiative, even though malaria is a reportable disease in every state. Thus, the above percentages are probably an underestimate of the number of patients with malaria that civilian physicians see.

Table 4 Malaria Cases by Period Between Date of Entry Into the United States and Onset of Illness, and by Plasmodium Species, United States, 1979

Period (in months)	<u>Plasmodium Species</u>							all cases (%)
	<u>vivax (%)</u>	<u>falciparum (%)</u>	<u>malariae (%)</u>	<u>ovale (%)</u>	<u>mixed (%)</u>	<u>undetermined (%)</u>		
< 1	129 (22.9)	77 (45.6)	7 (23.3)	1 (14.3)	4 (28.6)	20 (36.4)	238 (28.4)	
1 - 2	211 (37.4)	76 (45.0)	14 (46.6)	3 (42.8)	7 (50.0)	23 (41.8)	334 (39.8)	
3 - 5	99 (17.6)	2 ( 1.2)	3 (10.1)	1 (14.3)	0	2 ( 3.6)	107 (12.7)	
6-11	74 (13.1)	8 ( 4.6)	4 (13.2)	1 (14.3)	2 (14.3)	4 ( 7.2)	93 (11.1)	
≥ 12	19 ( 3.4)	1 ( .6)	1 ( 3.4)	1 (14.3)	1 ( 7.1)	1 ( 1.8)	24 ( 2.9)	
Unknown	32 ( 5.6)	5 ( 3.0)	1 ( 3.4)	0	0	5 ( 9.2)	43 ( 5.1)	
Total	564 (100.0)	169 (100.0)	30 (100.0)	7 (100.0)	14 (100.0)	55 (100.0)	839 (100.0)	

Table 5 Malaria Cases by Type of Initial Hospital Admission, United States, 1979\*

<u>Type of Hospital</u>	<u>Number of Patients</u>	<u>Percent</u>
Military	9	1.2
Veterans Administration	5	.6
Civilian	510	65.0
Public Health Service	16	2.0
Other	142	18.1
Not Hospitalized	102	13.1
Total	784	100.0

\*Hospital unknown for 55 patients

#### IV. MILITARY MALARIA

In 1979, 11 cases of malaria in military personnel were reported (Table 6). This represented a decrease over the number reported in 1978 (31 cases).

Table 6 Malaria Cases in Military Personnel, by Branch of Service, United States, 1979

V. <u>CIVILIAN MALARIA IMPORTED FROM ABROAD</u>	<u>Branch of Service</u>	<u>Cases</u>	
		<u>Number</u>	<u>Percent</u>
The number of imported civilian cases continued to increase in 1979. This trend has been evident for the last 10 years. Epidemiologic data show, however, that malaria among civilians includes different entities: U.S. civilians, foreign persons other than refugees, and refugees.	Air Force	2	18.2
	Army	3	27.3
	Navy	1	9.0
	Marine	2	18.2
	Unknown	3	27.3
	Total	11	100.0
A. <u>Malaria Among U.S. Civilians</u>			

For the period 1970-1978, the number of cases in civilians increased steadily, with the exception of 1976. In 1979, however, the number of cases (224) was fewer than recorded in 1978 (270). A review of the 1970-1979 cases (Table 7) shows that 48.7% of cases were acquired in Africa, 18.3% in Central America and Mexico, and 23.5% in Asia. The species distribution and citizenship status of cases for this period are shown in Table 8. Table 9 shows the age and sex distribution of cases and Table 10 their occupation.

Table 7 Malaria Cases in Civilians, by Area of Acquisition, United States, 1970-1979

<u>Area of Acquisition</u>	<u>U.S. Citizens</u>		<u>Foreigners</u> (refugees and non-refugees)	
	<u>Cases</u>	<u>Percent</u>	<u>Cases</u>	<u>Percent</u>
Africa	760	48.7	393	19.9
Central America and Mexico	285	18.3	266	13.4
Asia	366	23.5	1269	64.2
South America	76	4.8	24	1.2
Oceania	53	3.4	8	.4
Caribbean	1	.1	0	0
Middle East	16	1.0	18	.9
Total	1557	100.0	1978	100.0

Table 8 Malaria Cases by Nationality and Infecting Species, United States, 1970-1979

<u>Species</u>	<u>U.S. Citizens</u>		<u>Foreigners</u> (refugees and non-refugees)	
	<u>Cases</u>	<u>Percent</u>	<u>Cases</u>	<u>Percent</u>
<u>P. vivax</u>	762	50.5	1,200	69.7
<u>P. falciparum</u>	451	29.9	291	16.9
<u>P. malariae</u>	91	6.0	84	4.9
<u>P. ovale</u>	73	4.8	13	.8
Mixed	21	1.4	16	.9
Undetermined	<u>111</u>	<u>7.4</u>	<u>117</u>	<u>6.8</u>
Total	1,509	100.0	1,721	100.0

Table 9 Malaria Cases in Civilians, by Age and Sex, United States, 1979

<u>Age Group</u>	<u>Male</u>	<u>Female</u>	<u>Unknown</u>	<u>Total</u>
0- 9	11	6	0	17 ( 7.6)
10-19	11	10	0	21 ( 9.4)
20-29	42	22	1	65 ( 29.0)
30-39	28	14	0	42 ( 18.7)
40-49	20	8	1	29 ( 12.9)
50-59	16	8	0	24 ( 10.7)
60-69	9	4	0	13 ( 5.8)
>70	1	2	0	3 ( 1.3)
Unknown	<u>7</u>	<u>2</u>	<u>1</u>	<u>10</u> ( 4.5)
Total	145 (64.7)	76 (34.0)	3 (1.3)	224 (100.0)

Table 10 Malaria Cases in Civilians, by Occupation, United States, 1979

Tourist	33 ( 14.7)
Business Representative	21 ( 9.4)
U. S. Government Employee	6 ( 2.7)
Peace Corps Employee	16 ( 7.1)
Seaman	8 ( 3.6)
Teacher/Student	2 ( .9)
Other	48 ( 21.4)
Unknown	90 ( 40.2)
Total	224 (100.0)

B. Malaria Among Foreign Persons other than Refugees

The number of cases in foreign persons other than refugees has also increased since 1970; 414 cases were reported in 1979. Table 11 shows the distribution of these cases by age and sex, and Table 12 shows the area of acquisition. Of these cases 64.5% were acquired in Asia, with 40% of Asian cases acquired in India (168 cases).

Table 11 Malaria Cases in Foreign Persons other than Refugees, by Age and Sex, United States, 1979

<u>Age Group</u>	<u>Male</u>	<u>Female</u>	<u>Unknown</u>	<u>Total</u>
0 - 9	22	15	4	41 (10.0)
10-19	56	36	1	93 (22.4)
20-29	99	49	3	151 (36.4)
30-39	44	18	0	62 (15.0)
40-49	15	11	0	26 ( 6.3)
50-59	6	10	0	16 ( 3.9)
60-69	5	5	0	10 ( 2.4)
≥70	4	1	0	5 ( 1.2)
Unknown	<u>6</u>	<u>1</u>	<u>3</u>	<u>10</u> ( 2.4)
Total	257 (62.0)	146 (35.3)	11 (2.7)	414 (100.0)

Table 12 Malaria Cases in Foreign Persons other than Refugees by Area of Acquisition, United States, 1979

<u>Area</u>	<u>Cases</u>	<u>Percent</u>
Africa	67	16.2
Central America	68	16.4
South America	5	1.2
Carribean	0	0
Asia	267	64.5
Mid East	0	0
Oceania	0	0
Unknown	<u>7</u>	<u>1.7</u>
Total	414	100.0



# C. Malaria Among Refugees

In 1979, 107,157 refugees from Southeast Asia entered the United States. The influx of immigrants rose from 6,000 a month in the first 6 months of 1979 to a steady flow of 13,000 per month after August 1979. Table 13 shows the age and sex distribution of refugees with malaria and Table 14 the distribution of cases by species of infecting organism, country of origin, and camp of detention.

Table 13 Malaria Cases in Refugees, by Age and Sex, United States, 1979

<u>Age</u>	<u>Male</u>	<u>Female</u>	<u>Unknown</u>	<u>Total</u>
0 - 9	21	11	1	33 (17.6)
10-19	33	12	1	46 (24.7)
20-29	46	16	2	64 (34.3)
30-39	16	6	2	24 (12.8)
40-49	6	3	0	9 ( 4.8)
50-59	3	1	0	4 ( 2.1)
60-69	1	2	0	3 ( 1.6)
70	1	2	0	3 ( 1.6)
Unknown	1	0	0	1 ( .5)
Total	128 (68.4)	53 (28.4)	6 (3.2)	187 (100.0)

Table 14 Malaria Cases in Refugees, by Country of Origin, Location of Camp, and Species of Infecting Organism United States, 1979

Country of		SPECIES						
Origin	Camp	<u>Vivax</u>	<u>Falciparum</u>	<u>Malariae</u>	<u>Ovale</u>	<u>Mixed</u>	<u>Undetermined</u>	<u>Total</u>
Vietnam	Indonesia	36	24	1	0	1	2	64
	Malaysia	6	1	2	0	0	1	10
	Singapore	1	0	0	0	0	0	1
	Unknown	26	7	3	0	2	5	43
Laos	Indonesia	0	1	0	0	0	0	1
	Singapore	1	0	0	0	0	0	1
	Thailand	2	0	0	0	0	0	2
	Unknown	1	10	0	0	0	0	11
Cambodia	Indonesia	2	1	0	0	0	0	3
	Hong Kong	1	0	0	0	0	0	1
	Thailand	8	1	1	0	1	1	12
	Unknown	28	3	1	0	1	2	35
Unknown		2	1	0	0	0	0	3
Total		114	49	8	0	5	11	187

## VI. MALARIA ACQUIRED IN THE UNITED STATES

In 1979, 1 transfusion (induced) case of malaria and 3 cases of congenital malaria were reported in the United States.

### A. Induced Malaria

Case 1 - On July 30, 1979, a 27-year-old white woman, who was working as a laboratory assistant, stuck her finger with a needle contaminated with chloroquine-resistant P. falciparum infected blood. On August 13, the patient experienced fever and chills. Blood smears taken on 3 consecutive days were negative. On August 20, P. falciparum was identified on a fourth blood smear. The patient was treated with quinine and tetracycline 250 mg 4 times a day for 10 days. The parasitemia cleared, and the patient recovered uneventfully.

(Reported by Neal Smith, M.D., Bernadillo County Medical Center; New Mexico State Health Department; Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

### B. Congenital Malaria

Case 1 - A 28-day-old Kampuchean boy was admitted to Hermann Hospital, University of Texas Medical School at Houston, on October 31, 1979, with a 2-day history of fever and vomiting. The parents were refugees from northwest Kampuchea who arrived in the United States 2 months before the child's birth; both parents were screened for malaria, with negative results, shortly after their arrival. The mother had no history of malaria symptoms except for unexplained chills before delivery. At birth the infant was noted to be well except for prolonged jaundice. On admission he was found to have hepatosplenomegaly, thrombocytopenia ( $42,000/\text{mm}^3$ ), and monocytosis. Blood smears revealed P. vivax. The infant was treated with chloroquine phosphate, which produced rapid defervescence, resolution of monocytosis and thrombocytopenia, and clearing of parasitemia.

(Reported by T.G. Cleary, M.D., University of Texas Health Science Center at Houston; Texas State Department of Health; Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 2 - On September 11, 1979, a 5-week-old girl from India was admitted to a New Jersey hospital with a history of fever and chills. The child had been seen a week earlier for similar symptoms by a local physician and treated for "flu."

Past medical history revealed that her mother arrived from India in September 1978. During the first trimester of pregnancy the mother experienced an episode of fever and chills which lasted 1 day.

On the day of admission the child showed fever, splenomegaly, and anemia (hemoglobin - 6.5 gm). Blood smears showed the presence of P. vivax. The baby's serologic titers were 1:256 for P. vivax, and negative for other Plasmodium species. Because the examination of the mother's peripheral blood smear was negative and in the absence of clinical symptoms, she was not treated. The baby was treated with chloroquine and primaquine and discharged after clearance of the parasitemia.

(Reported by Arvind P. Shah, M.D., Westfield Health Department; New Jersey State Health Department; Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 3 - On November 27, 1979, a 6-week-old girl from India was admitted to a San Francisco hospital for fever and chills. Past medical history revealed that the baby's mother immigrated to the United States with her husband in September 1978 from Bombay. Although she was treated for malaria in India in September 1978,

she had no history of illness during pregnancy. The baby's father was treated for malaria in January 1975. The baby's blood smears revealed the presence of P. vivax and P. malariae. The patient was started on chloroquine phosphate and primaquine and discharged after clearance of the parasitemia.

(Reported by Caroline Macleod, M.D.; Robert Goldsmith, M.D., Department of Epidemiology and International Health, University of California, San Francisco, California; R.R. Robert, M.D., California Department of Health Services; Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

## VII. MALARIA DEATHS AND COMPLICATIONS IN THE UNITED STATES

### A. Malaria Deaths

Two deaths attributed to malaria were reported in the United States in 1979; the first occurred in a patient who contracted the infection in Haiti, and the second in a patient who was infected in Kenya. In both cases, the species involved was P. falciparum.

Case 1 - A 59-year-old Puerto Rican missionary spent 17 days in Haiti and returned to Puerto Rico on November 17, 1979, with fever and chills. He was hospitalized on November 25 and died 2 days later. On examination of blood smears, a diagnosis of P. falciparum malaria was made. The indirect immunofluorescence test revealed reciprocal titers of 4096 for P. falciparum, 256 for P. vivax, and 256 for P. malariae. No antimalarial chemotherapy was received by the patient.

(Reported by C. Bakal, M.D., J. Welton, M.P.H., J. Marr, M.D., Director, Bureau of Preventable Diseases, New York City Department of Health; G. Vasquez, M.D., C. Sanchez, M.D., Infectious Diseases Department, University Hospital, Puerto Rico; A. Hernandez-Torres, M.D., Puerto Rico Department of Health; San Juan Laboratories, Bureau of Laboratories, and Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

Case 2 - A 78-year-old white woman was brought to a hospital emergency room in New York City on March 9, 1979, complaining of diarrhea, weakness, nausea, vomiting, and fever. The symptoms had started 1 week after her return from Kenya. She consulted her physician on March 4, 1979, but a diagnosis of malaria was not made at that time, and she received no specific treatment. On March 9, 1979, P. falciparum was found on blood smears. The patient received 2.5 gm of chloroquine phosphate but died on March 11, 1979.

(Reported by J.S. Marr, M.D., Department of Health, City of New York; Parasitic Diseases Division, Bureau of Epidemiology, CDC.)

### B. Malaria Complications

Eighty-six complications of malaria, aside from death, were reported in 1979 (Table 15).

Table 15 Malaria Cases by Complications and Species of Infecting Organism, United States, 1979

	<u>Vivax</u>	<u>Falciparum</u>	<u>Malariae</u>	<u>Ovale</u>	<u>Mixed</u>	<u>Undetermined</u>	<u>Total</u>
Hemolysis	40	19	3	1	1	2	66
Cerebral	3	8	0	0	0	0	11
Renal	1	3	0	0	1	1	6
Other	<u>3</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>3</u>
Total	47	30	3	1	2	3	86
Total Number of Cases Diagnosed	564	169	30	7	14	55	839

# VIII. REPORT FROM THE NATIONAL MALARIA REPOSITORY - 1979

The presence of Plasmodium species or agreement that there were no parasites present was confirmed in blood films from 230 patients submitted to the National Malaria Repository in 1979. In 1 case the film submitted as P. falciparum, in 2 cases those submitted as P. malariae, and in 1 that was submitted as Plasmodium species were later found to be negative at CDC. No specimens submitted as negative were later found to be positive at CDC. In 9 instances the species diagnosis of the National Malaria Repository differed from that of the institution submitting the slide. The origin and species diagnosis of malaria smears examined by the repository are shown in Tables 16 and 17.

Table 16 Malaria Cases by Institutions Submitting Positive Slides to the National Malaria Repository\*, United States, 1977-1979

	ORIGIN						
	<u>Army</u>	<u>Navy</u>	<u>Air Force</u>	<u>VA Hosp.</u>	Public Health Service & Health Department (State, County, City)	Other Hospitals Clinics Physicians etc.	<u>Cumulative</u>
Cumulative total positive 1979	0	1	0	3	140	86	230
Cumulative total positive 1978	0	0	4	1	94	48	147
Cumulative total positive 1977	1	1	3	0	79	37	121

\*CDC

Table 17 Malaria Cases by Plasmodium Species Identified by National Malaria Repository\*, United States, 1976-1979

<u>Species</u>	<u>1979</u>	<u>1978</u>	<u>1977</u>	<u>1976</u>
<u>P. vivax</u>	72	79	73	79
<u>P. falciparum</u>	43	44	34	43
<u>P. malariae</u>	6	4	1	4
<u>P. ovale</u>	8	9	2	4
<u>Plasmodium</u> sp.	4	11	10	4
Negative	95	70	61	63
Total examined	230	217	182	197
Cumulative positive	135	147	121	134

\*CDC

## IX. PREVENTION OF MALARIA

The purpose of these tables is to provide international travelers with current information about the risk of acquiring malaria in areas of the world that they intend to visit. This information is abstracted from the World Health Organization's Weekly Epidemiologic Record 53: 190-196, 1978 (also see Fig. 3). Table 18 provides information on countries with no malaria risk. For detailed information on each country with a malaria risk see Table 19.

Table 18 Countries or Areas Malaria Free

<b>AFRICA</b>			
Chagos Arch.	French Southern and Antarctic Terr.	Lesotho	St. Helena
<b>AMERICA, NORTH</b>			
Antigua	Cuba	Montserrat	St Pierre and Miquelon
Bahamas	Dominica	Netherl. Antilles	St Vincent
Barbados	Greenland	Panama Canal Zone	Trinidad and Tobago
Bermuda	Grenada	Puerto Rico	Turks and Caicos I.
Brit. Virgin I.	Guadeloupe	St Kitts-Nevis- Anguilla	United States of America
Canada	Jamaica	St Lucia	United States Virgin I.
Cayman I.	Martinique		
<b>AMERICA, SOUTH</b>			
Brit. Antarctic Terr.	Chile	Falkland I.	Uruguay
<b>ASIA</b>			
Brunei	Israel	Kuwait	Macao
Cyprus	Japan	Lebanon	Mongolia
Hong Kong	Korea Dem. People's Rep. of		
<b>EUROPE</b>			
Albania	German Dem. Rep.	Liechtenstein	Spain
Andorra	Germany Fed. Rep.	Luxembourg	Svalbard and Jan Mayen I.
Austria	Gibraltar	Malta	Sweden
Belgium	Greece	Monaco	Switzerland
Bulgaria	Holy See	Netherlands	United Kingdom of Great Britain and Northern Ireland
Czechoslovakia	Hungary	Norway	Yugoslavia
Denmark	Iceland	Poland	
Faroe I.	Ireland	Portugal	
Finland	Isle of Man	Romania	
France	Italy	San Marino	
<b>OCEANIA</b>			
American Samoa	Cook I.	Nauru	Pitcairn I.
Australia	Fiji	New Caledonia	Samoa
Canton and Enderbury I.	French Polynesia	New Zealand	Tokelau I.
Christmas I.	Gilbert I.	Niue I.	Tonga
(Australia)	Guam	Norfolk I.	Tuvalu
Cocos	Johnston I.	Pacific I. (Trust Terr.)	Wake I.
	Midway I.		Wallis and Futuna I.
<b>UNION OF SOVIET SOCIALIST REPUBLICS</b>			

Official information on the distribution of malaria in the USSR is not available. However, areas commonly visited by tourists are considered malaria free.

Table 19 Information on Countries with Malaria Risk

MALARIA RISK		
Country 1	Where? 2	When? 3
<b>AFRICA</b>		
Algeria .....	Ouargla Wilaya (= Dep.)	5-11
Angola .....	Whole country.	1-12
Benin .....	Whole country. /	1-12
Botswana .....	Whole country excl.: Kgalagadi, Kweneng (part.), Ngwaketse, District; southern part of Central, Ghanzi, District; urban areas of Gaborone, Francistown, Lobatsi, Selebi-Pikwe.	5-11
Burundi .....	Whole country.	1-12
Cape Verde .....	Whole country.	...
Central African Emp. ....	Whole country.	1-12
Chad .....	Whole country.	7-11
Comoros .....	Whole country.	1-12
Congo .....	Whole country.	1-12
Djibouti .....	Occasionally, in the whole country.	...
Egypt .....	Nile delta, El Faiyum area, the oases, and part of Upper Egypt, excl. urban areas.	6-10
Equatorial Guinea .....	Whole country.	1-12
Ethiopia .....	Whole country below 2000 m.	1-12
Gabon .....	Whole country below 1000 m.	1-12
Gambia .....	Whole country.	1-12
Ghana .....	Whole country.	1-12
Guinea .....	Whole country.	1-12
Guinea-Bissau .....	Whole country.	1-12
Ivory Coast .....	Whole country.	1-12
Kenya .....	Whole country, but normally no risk in Nairobi Township and in the highlands (above 2500m) of Central, Rift Valley, Eastern, Nyanza, Prov.	1-12 <sup>1</sup>
Liberia .....	Whole country.	1-12
Libyan Arab Rep. ....	2 small foci in the southwest of the country.	2-8
Madagascar .....	Whole country excl. areas above 1100 m. Ambatolampy, Ambohidratrimo, Andramasina, Antanifotsi, Antsirabe, Arivonimamo, Faratsiho, Manjakandriana, Tananarive, Tananarive-Banlieue, Sous-Prefectures.	9-3
Malawi .....	Whole country.	1-12
Mali .....	Whole country.	1-12 <sup>2</sup>
Mauritania .....	Whole country.	...
Morocco .....	Azilal, Beni Mellal, Kenitra, Khemisset, Khouribga, Ouarzazate, Settat, Tiznit, Prov. excl. urban areas.	5-10
Mozambique .....	Whole country.	...
Namibia .....	Whole country.	...
Niger .....	Whole country.	7-11 <sup>3</sup>
Nigeria .....	Whole country.	1-12
Rwanda .....	Whole country.	1-12
Sao Tome and Principe .....	Whole country.	...
Senegal .....	Whole country <sup>4</sup> .	1-12 <sup>5</sup>
Sierra Leone .....	Whole country.	1-12
Somalia .....	Whole country <sup>6</sup> .	1-12
South Africa .....	North, east and western low altitude areas of Transvaal. Natal coastal areas north of 28° S (Richards Bay).	1-12

<sup>1</sup> Eastern Prov. (part.), North-Eastern Prov., Rift Valley Prov. (part.): 4-6 & 11-12.

<sup>2</sup> 4-6: Less risk -

<sup>3</sup> Agades Dep.: 8-10.

<sup>4</sup> Dakar (town - ville): No risk.

<sup>5</sup> Cap-Vert: Less risk during

<sup>6</sup> Mogadishu: very low risk



Table 19 (Continued)

MALARIA RISK		
Country 1	Where? 2	When? 3
Southern Rhodesia .....	...	...
Sudan .....	Whole country.	1-12
Swaziland .....	Northern border areas — Bordergate, Lomahasha, Mhlume, Tshaneni.	12-3
Togo .....	Whole country.	1-12
Tunisia .....	Occasionally rural areas of the north	5-11
Uganda .....	Whole country below 1800 m excl. Kigezi, Distr. (southern part) <sup>1</sup> .	1-12
United Rep. of Cameroon .....	Whole country.	1-12
United Rep. of Tanzania .....	Whole country.	1-12
Upper Volta .....	Whole country.	1-12 <sup>2</sup>
Zaire .....	Whole country.	1-12
Zambia .....	Whole country.	11-5
<b>AMERICA, NORTH</b>		
Belize .....	Whole country (below 400 m) excl.: Belize District and urban areas.	1-12
Costa Rica .....	Below 500 m, excl. urban areas: Alajuela, Guanacaste, Puntarenas, Prov.	1-12
Dominican Rep. ....	Below 400 m, excl. urban areas: Pedernales Mun. (Pedernales Prov.); Elias Pina, El Llano, Banica, Mun. (Estrelleta Prov.); Dajabon, Partido, Mun. (Dajabon Prov.); Pepillo Salcedo Mun. (Monte Cristi Prov.).	1-12
El Salvador .....	Whole country below 1000 m, excl. urban areas	1-12
Guatemala .....	Below 1500 m, excl. urban areas: Dep.: Alta Verapaz <sup>3</sup> , Baja Verapaz, Chiquimula, Escuintla, Huehuetenango <sup>3</sup> , Izabal <sup>3</sup> , Jalapa, Jutiapa <sup>3</sup> , El Peten, El Progreso, El Quiche, Retalhuleu <sup>3</sup> , Santa Rosa, Suchitpequez, Zacapa; Mun.: San Martin Jilotpeque (Chimaltenango Dep.), Coatepeque (Quetzaltenango Dep.), Malacatan, Ocos (San Marcos Dep.).	6-10
Haiti .....	Whole country below 300 m	1-12
Honduras <sup>4</sup> .....	Whole country (below 1000 m) excl. urban areas and excl. Ocotepeque Dep.	1-12 <sup>5</sup>
Mexico .....	Below 1000 m, excl. urban areas: Chiapas, Guerrero, Michoacan, Nayarit, Oaxaca, States — Etats; Morelos, Pueblo (part.), States — Etats; Alamos Mun. (Sonora State — Etat); Chihuahua (part.), Durango (part.), Jalisco (part.), Sinaloa, States — Etats.	1-12 6-10 5-10
Nicaragua .....	Rural areas below 1000 m as well as outskirts of: Chinan, Leon, Granada, Managua, Nandaine, Tipitapa, towns. No risk: Nueva Segovia, Madriz, Dep.	5-12
Panama .....	Below 800 m, excl. urban areas: Prov.: Darien, Bocas del Toro, Colon (excl. Ciudad Colon); Distr.: Santa Fe (Veraguas Prov.), Chepo, Chiman (Panama Prov.); Comarca de San Blas.	1-12

<sup>1</sup> Entebe, Fort Portal, Jinja, Kampala, Mbale: No risk<sup>2</sup> Djibo, Oudalan, cercles: 6-12.<sup>3</sup> Risk also in urban areas.<sup>4</sup> Based on WHO *Wkly Epidem. Rec.*, No. 24, 1976 — D'apres *Releve epidem. hebdomadaire de l'OMS*, No. 24, 1976.<sup>5</sup> Conan, Intibuca, La Paz, Lemnira, Olancho, Dep.: 5-12.

Table 19 (Continued)

MALARIA RISK		
Country 1	Where? 2	When? 3
<b>AMERICA, SOUTH</b>		
Argentina .....	Part of (below 1200 m) and excl. urban areas: Iruya, Oran, San Martin, Santa Victoria, Dep. (Salta Prov.).	10-5
Bolivia .....	Whole country (below 2000 m) excl. urban areas and excl.: La Paz (Highlands), Oruro, Potosi, Prov.	1-12
Brazil .....	Below 900 m: Acre, State; Amapa, Rondonia, Roraima, Terr.;	1-12
Colombia .....	Part of and excl. urban areas: Amazonas, Bahia, Esmeraldas, Guayas, Manabi, Prov.; Excl. urban areas: Morona Santiago, Napo, Pastaza, Zamora Chinchipe, Prov.; El Oro, Los Rios, Prov.	1-12 1-12 3-6
Ecuador .....	Whole area (excl. Cayenne City).	1-12
French Guiana .....	Below 900 m: North-West, Rupununi, Regions.	1-12
Guyana .....	Some rural parts of: Amambay, Kanendiyu, Alto Parana, Dep.	10-5
Paraguay .....	Below 1500 m (excl. urban areas): Dep.: Amazonas, Cajamarca (excl. Hualgayoc Prov.), La Libertad (excl. Otuzco, Santiago de Chuco, Prov.), Lambayeque, Loreto, Piura (excl. Talara Prov.), San Martin, Tumbes; Prov.: Santa (Ancash Dep.), part of: La Convencion (Cusco Dep.), Tayacaja (Huancavelica Dep.), Satipo (Junin Dep.).	1-12
Peru .....	Below 1300 m (excl. urban areas): Brokopondo (south of 5° lat. N), Commewijne, Marowijne, Nickerie, Saramacca, Districts.	1-12
Surinam .....	Below 600 m (excl. urban areas): Terr. Fed. Amazonas: Atabapo, Atures, Casiquiare, Rio Negro, Dep.; Apure, State: Codazzi, Cunaviche, Elorza, Guachara, Guasdualito, San Camilo, Urdaneta, Mun.; Bolívar, State: Caicara, La Paragua, Santa Rosalia, La Urbana, Santa Elena, Mun.; Barinas, State: Andres E. Blanco, Ciudad Bolívar, Santa Barbara, Mun.; Merida, State: Alberto Adriani, Caracciolo Parra Olmedo, Eloy Paredes, Obispo Ramos de Lora, Mun.; Tachira, State: Cardenas, La Concordia, Cordoba, Garcia de Hevia, Jose T. Colmenares, Pre-gonero, Rivas Berti, San Antonio de Caparo, San Simon, Mun.; Zulia, State: Encontrados, Bartolome de las Casas, Libertad, Jesus Maria Semprum, Santa Cruz, Urribarri, Mun.	1-12
Venezuela .....		

Table 19 (Continued)

[illegible]<sup>1</sup> and excl. urban areas.

Table 19 (Continued)

MALARIA RISK		
Country 1	Where? 2	When? 3
	Isfahan, Kerman (part.), Khorasan, Kordestan (part.), Mazandaran, Semnan, Teheran (Central), Yazd, Zanjan.	
Iraq .....	Northern region (below 1500 m): Duhok, Erbil, Kirkuk, Ninawa, Sulaimaniya, Prov.	5-11
Jordan .....	Only some rural areas of Jordan Valley and Kerak Lowlands.	4-11
Korea, Rep. of .....	Rural areas of: Chung-chong Pukdo, Kyongsang Pukdo, Prov.	5-10
Lao People's Dem. Rep. ....	Whole country excl.: Vientiane.	1-12
Malaysia .....	Whole country (below 1700 m. excl. urban areas).	1-12
Maldives .....	Whole country, excl. Male Island and urban areas.	1-12
Nepal .....	Excl. urban areas: All hill districts (below 1200 m); All Terai districts; All foothills, inner and forested Terai districts;	6-9 5-9 1-12
Oman .....	Whole country	1-12
Pakistan .....	Whole country (below 2000 m)	3-10
Philippines .....	Whole country (below 600 m) excl. urban areas and excl.: Bohol (part.), Catanduanes, Cebu, Leyte. Misamis occidental, Prov.; plain areas of:	1-12
Qatar .....	Whole country	1-12
Saudi Arabia .....	Whole country excl.: Alhasa, Arar, Jauf, Quraiya (Gurayyat), Riyadh. Tabuk, Taif. and the urban areas of: Jeddah, Mecca, Medina, Qatif.	1-12
Singapore .....	Particularly on the islands, not in urban areas.	1-12
Sri Lanka .....	Amparai, Anuradhapura, Badulla (part.), Batticaloa, Hambantota, Jaffna, Kandy, Kegalle, Kurungala, Mannar, Matale, Matara, Moneragala, Nuwara Eliya (part.), Polonnaruwa, Puttalam, Ratnapura, Trincomalee, Vavuniya, Districts, except Colombo.	1-12
Syrian Arab Rep. ....	Occasional risk in the whole country (below 600 m), excl. urban areas and excl.: Damascus, Deir-esZor, Hama, al Hasakeh, Homs, Latakia, Sweida, Tartus, Districts.	5-10
Thailand .....	Rural, especially forested and hilly areas in the whole country. —	1-12
Turkey .....	Potential risk in the whole country; local health authorities to be consulted.	7-10 <sup>1</sup>
United Arab Emirates .....	Whole country.	1-12
Viet Nam .....	Whole country.	1-12
Yemen .....	Whole country (below 1400 m) excl.: Hajja, Sada, Prov.	9-2
Yemen, Democratic .....	Whole country excl. First Governorate (Aden and airport perimeter).	1-12
<b>OCEANIA</b>		
New Hebrides .....	Whole area excl.: Futuna Is., Luganville Town, Port Vila.	1-12
Papua New Guinea .....	Whole country.	1-12
Solomon Is. ....	Whole country (below 400 m) excl. some eastern and southern outlying islets.	1-12

<sup>1</sup> Hakkari Prov.: 8-10; Siirt Prov.: 7-9.

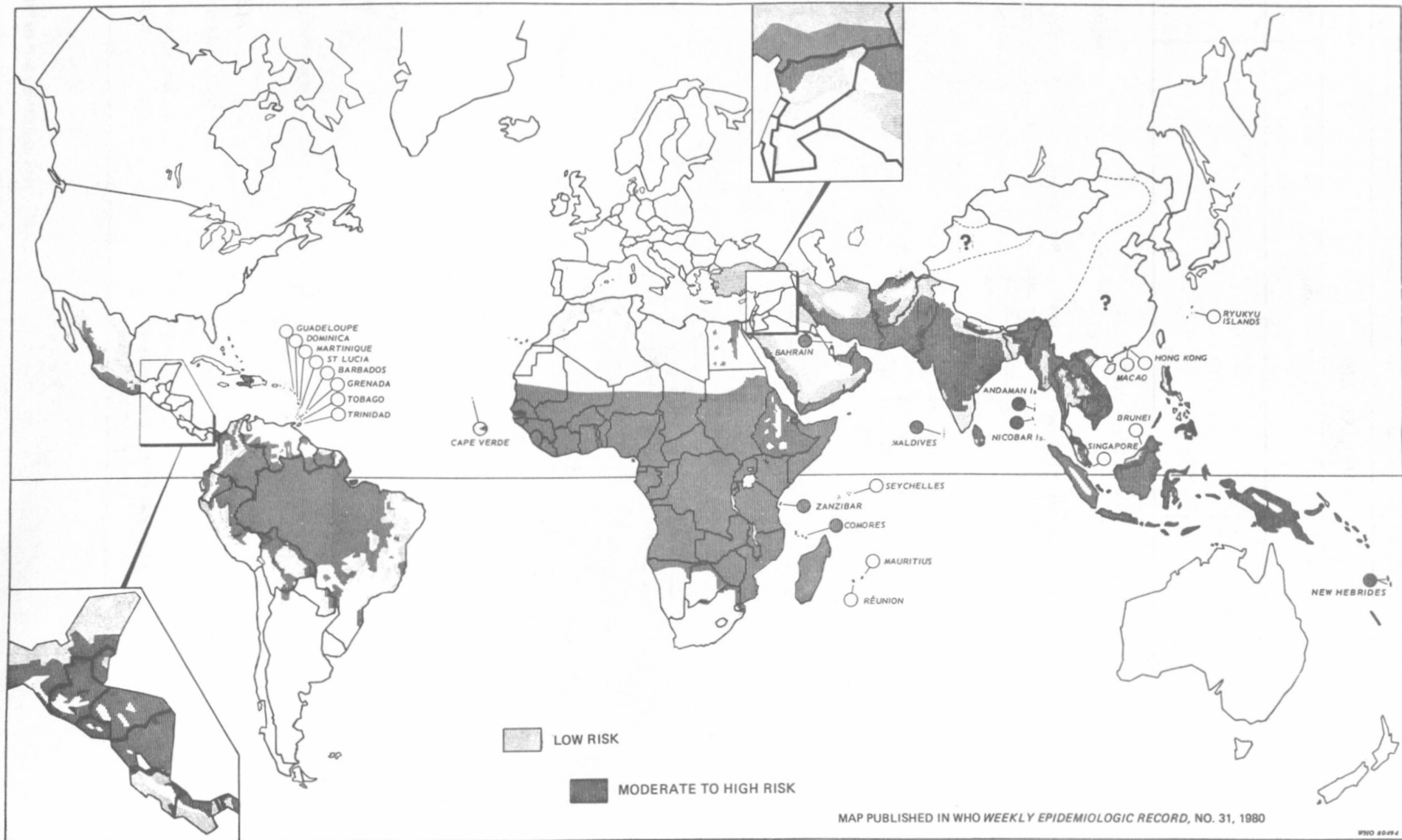
Table 19 (Continued)

MALARIA RISK		
Country 1	Where? 2	When? 3
UNION OF SOVIET SOCIALIST REPUBLIC		
Union of Soviet Socialist Rep. . . . .	...	

Abbreviations – Abreviations

...	No official information available. The reader may refer to the map outlining broadly the areas with risk of malaria.	Mun. Municipio (Department).
Arch. Archipelago		Pop. Populaire.
Distr. District.		part. Partially.
Dem. Democratic		Prov. Province.
Dep. Department		Reg. Region.
excl. Excluding		Rep. Republic.
incl. Including		St. Saint.
Is. Island(s) (Isles)		Terr. Territory.
		v. <i>vide</i>

Fig. 3 AREAS OF RISK FOR MALARIA TRANSMISSION, DECEMBER 1978





#### Chemoprophylaxis of Malaria:

All tourists who travel in a malarious area should use a prophylactic drug no matter how brief their visit. The drug of choice for most areas is chloroquine phosphate 500 mg (300 mg base) once a week beginning 1-2 weeks before entering the malarious area and continuing for 6 weeks after departure from the malarious area. The pediatric dose of chloroquine phosphate is 5 mg per kg (base) once a week. Alternatives to chloroquine phosphate, which are given at the same intervals as chloroquine, are hydroxychloroquine sulfate 400 mg (310 mg base) and amodiaquine hydrochloride 520 mg (400 mg base). These drugs will suppress a clinical attack of malaria. Primaquine phosphate can be used for terminal chemoprophylaxis, but it should not be given routinely. Its use depends on the intensity of exposure to malaria and on whether the patient is glucose-6-phosphate dehydrogenase (G-6-P-D) deficient. The dose is 26.3 mg (15 mg base) a day for 14 days after the patient's last exposure. Subsidiary measures to reduce contact with night-biting mosquitoes include the use of insecticides, mosquito nets and screens, and long sleeves and trousers.

There are areas of the world in which malaria due to P. falciparum is resistant to chloroquine. These areas include parts of Asia and South America and are summarized in Table 20, abstracted from the World Health Organization's Weekly Epidemiological Record 52:366-370, 1977. The reader is encouraged to consult the above reference for more detailed information on these areas. A combination of pyrimethamine and sulfadoxine, a long-acting sulfonamide, has proven to be effective in the prevention of chloroquine-resistant P. falciparum malaria. This drug is not presently available in the United States, but it is marketed in other countries in a single tablet form, under the trade names Fansidar, Falcidar, or Methipox\*. Administration of 2 tablets on alternate weeks during and for 6 weeks after exposure to malaria has been found to be effective in the prevention of chloroquine-resistant malaria. More information on the chemoprophylaxis of malaria may be found in the Morbidity and Mortality Weekly Report (CDC) 1978; 27:(Supplement): 81-90.

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\*Use of trade names is for identification only and does not constitute endorsement by the Public Health Service or the U.S. Department of Health and Human Services.

Table 20 Areas in Which Chloroquine-Resistant Strains of  
P. falciparum Have Been Reported

<u>Country</u>	<u>Name of Area</u>	<u>Years of Study</u>
<b>AFRICA</b>		
Kenya	Isolated reports	1978
Tanzania	Isolated reports	1978
<b>AMERICAS</b>		
Brazil	States in interior of country; Espirito Santo State (coastal area north of Rio de Janeiro)	1961-69
Colombia	All malarious areas except west coast	1961-73
Ecuador	Provinces in interior of country bordering Colombia	1975-76
French Guiana	Isolated reports	1975
Guyana	Brazil-Guyana border area	1969, 71
Panama	All areas east of Canal Zone including San Blas	1969-75
Surinam	All malarious areas	1973-75
Venezuela	All malarious areas	1964-74
<b>ASIA</b>		
Bangladesh	Border areas with Assam State, India, and Burma	1970-75
Burma	All malarious areas	1969-75
Dem. Kampuchea	All malarious areas	1962
India	Assam State	1973
Indonesia	East Kalimantan (Island of Borneo) Irian Jaya (Island of New Guinea)	1974 1974
Laos	Vientiane Province	1976
Malaysia		
West	All malarious areas	1963
Sabah	All malarious areas	1971-75
Papua New Guinea	Border area with Irian Jaya, Indonesia	1976
Philippines	Luzon Island Brazilian Island and Sulu Archipelago Mindoro Island Palawan Island	1969-76 1975 1974 1969
Thailand	All malarious areas	1961-71
Vietnam	Widespread	1962

## X. MICROSCOPIC DIAGNOSIS OF MALARIA

Early diagnosis of malaria requires a high level of clinical suspicion and, in particular, the careful taking of a travel history from every patient with a fever of unknown origin. Once the diagnosis is suspected, a Giemsa-stained smear of peripheral blood should be examined for the presence of parasites. Since the accuracy of diagnosis is dependent on the quality of the blood film, the following guide is offered for the proper preparation of thick and thin blood smears.

1. Manufacturers' "pre-cleaned" slides are not considered clean enough for use in malaria diagnosis. Prior to use, such slides should be washed in mild detergent, rinsed thoroughly in warm running water, then in distilled water, and dipped in ethyl alcohol (90% to 95%). Slides may then be wiped dry with a lintless cloth or tissue for immediate use or stored in 95% alcohol until needed.

2. The patient's finger should be cleaned with alcohol and wiped dry with a clean cloth or gauze.

3. After puncturing the finger with the blood lancet, allow a large globule of blood to form.

4. Place cleaned surface of slide against drop of blood and with a quick circular motion, make a film the size of a dime in the middle third of 1 end of the slide. Ordinary newsprint should be barely legible through such a wet drop (Fig. 4). (Excessive mixing or stirring with a second slide leads to distortion of blood cells and parasites.)

5. The finger should then be wiped dry and a small drop of blood gently squeezed from the puncture and placed at the edge of the middle third of the same slide (Fig. 5).

6. Apply a clean "spreader" slide to the edge of the small drop at a 45° angle and allow the blood to extend about two-thirds of the slide width; then keeping even contact, push the spreader forward along the slide. This will produce an even layer of red blood cells with a "feathering" at the lower edge (Fig. 6).

7. The blood film should be kept horizontal and protected from dust and insects while the thick film dries (minimum of 6 hours at room temperature).\*

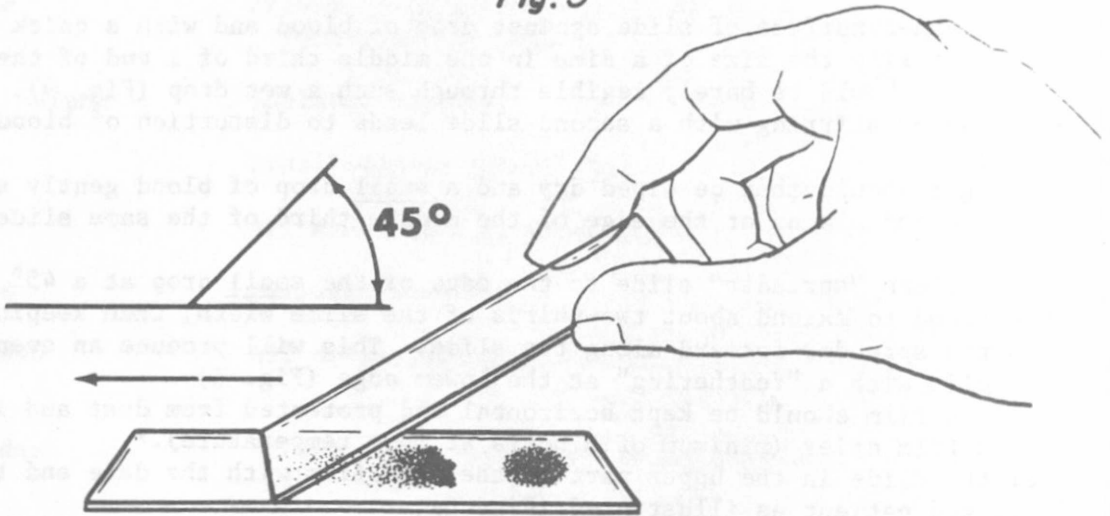
8. Label the slide in the upper part of the thin film with the date and the name or initials of the patient as illustrated (Fig. 6).

\*If a rapid diagnosis is desired, the thin and thick films may be made on separate slides. The thin film can be air dried, fixed with methyl alcohol, and stained immediately. If no parasites are found on the thin film, the thick film should be examined subsequently for rare organisms not detected on the thin preparation.

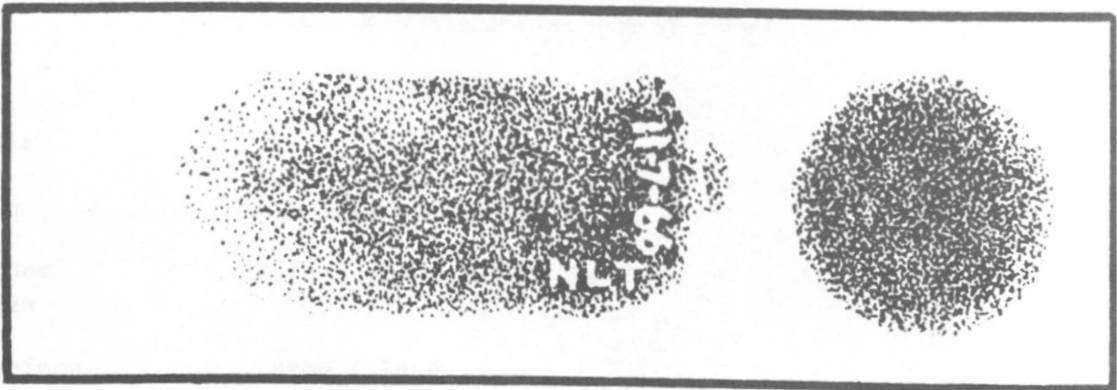
**Fig. 4**

in all their phases. The importance of the examination of blood films for the presence of malaria parasites will be fully understood

**Fig. 5**



**Fig. 6**



## ACKNOWLEDGMENT

The Malaria Surveillance Report, prepared annually at the Center for Disease Control, is based on information provided in individual case reports. The excellent support given to malaria surveillance by state and local health departments and personnel of the preventive medicine services of the U.S. Army, Navy, and Air Force, is greatly appreciated.

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1. World Health Organization: Terminology of malaria and of malaria eradication, 1963, p 32
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# STATE EPIDEMIOLOGISTS

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California	James Chin, MD
Colorado	Richard S Hopkins, MD
Connecticut	Anthony V Sardinas, MPH
Delaware	Ernest S Tierkel, VMD
District of Columbia	Martin E Levy, MD
Florida	Robert A Gunn, MD
Georgia	R Keith Sikes, DVM
Guam	Robert L Haddock, DVM
Hawaii	Ned H Wiebenga, MD
Idaho	Fritz R Dixon, MD
Illinois	Bryon J Francis, MD
Indiana	Charles L Barrett, MD, Acting
Iowa	Laverne A Wintermeyer, MD
Kansas	Donald E Wilcox, MD
Kentucky	Calixto Hernandez, MD
Louisiana	Charles T Caraway, DVM
Maine	William S Nersesian, MD, Acting
Maryland	David L Sorley, MD
Massachusetts	Nicholas J Fiumara, MD
Michigan	Norman S Hayner, MD
Micronesia*	Masao Kumangai, MD
Minnesota	Andrew G Dean, MD
Mississippi	Durward L Blakey, MD
Missouri	H Denny Donnell, Jr, MD
Montana	Martin D Skinner, MD
Nebraska	Paul A Stoesz, MD
Nevada	William M Edwards, MD
New Hampshire	Vladas Kaupas, MD
New Jersey	William E Parkin, DVM
New Mexico	Sandra C Lapham, MD, Acting
New York State	Richard Rothenberg, MD
New York City	Stephen M Friedman, MD
North Carolina	Martin P Hines, DVM
North Dakota	Kenneth Mosser
Northern Mariana Islands*	Frank T Palacios, MD
Ohio	Thomas J Halpin, MD
Oklahoma	Mark A Roberts, PhD
Oregon	John A Googins, MD
Pennsylvania	Ernest J Witte, VMD, Acting
Puerto Rico	Antonio Hernandez, MD
Rhode Island	Gerald A Faich, MD
South Carolina	Richard L Parker, DVM
South Dakota	James D Corning, BA
Tennessee	Robert H Hutcheson, Jr, MD
Texas	Charles R Webb, Jr, MD
Utah	Richard E Johns, Jr, MD
Vermont	Richard L Vogt, MD
Virginia	Grayson B Miller, Jr, MD
Virgin Islands	C Warren Smith, MD
Washington	Jack Allard, PhD
West Virginia	Loretta E Haddy, MS, Acting
Wisconsin	Jeffrey P Davis, MD
Wyoming	Herman S Parish, MD

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